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ABSTRACT

This report, the third in a series on productivity and job security, presents three case studies which detail various forms of continuing education and training. Four important factors in the cases are identified: employment stability, management support for training, adaptation to changing job requirements, and training evaluation. The first case study from IBM states that despite educational opportunities, plus strong assurance of enduring employment, many mature engineers did not enroll in job-related courses. IBM is now attempting to motivate engineers through job redesign and other measures. Case 2 is concerned with a Xerox training approach which provides continuing education through the corporation and educational institutions. It is suggested that Xerox may be able to develop internally most of its senior managers rather than hire new managers from outside. The third case history is a study of the provision by a Pennsylvania state agency of training to municipal employees. One implication drawn from this study and the IBM study is that eliminating the costs of training may be an insufficient stimulus for participation. Steady employment is cited as an important element. (Two earlier reports in this series are also available--see note.) (CSS)

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PRODUCTIVITY AND JOB SECURITY

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Case Studies of Continuing Education for Engineers, Technicians, and Managers

U.S. DEPARTMENT OF HEALTH,
EDUCATION & WELFARE
NATIONAL INSTITUTE OF
EDUCATION

Spring 1978

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The 94th Congress created the National Center for Productivity and Quality of Working Life on November 28, 1975, as an independent Federal agency. The Center's enabling legislation (P.L. 94-136) establishes a national policy encouraging "productivity growth consistent with needs of the economy, the natural environment, and the needs, rights, and best interests of management, the work force, and consumers." The Center's purpose is to stimulate national efforts to implement this policy.

The Center's small staff of productivity specialists supports the Board of Directors in pursuit of seven main objectives:

- Document and recommend policies to satisfy the Nation's capital investment needs from a productivity standpoint.
- Encourage labor-management cooperation to enhance productivity and the quality of working life.
- Without compromising legislative intent, identify and recommend changes in government regulation which will improve productivity.
- Stimulate and support industry task forces formed to conduct programs for industrywide productivity improvement.
- Develop and recommend more effective approaches to improving productivity in the public sector.
- Improve the review, coordination, and integration of productivity enhancement efforts of other Federal agencies.
- Develop a better understanding of the concept of productivity and encourage better techniques for measuring productivity changes.

The Board of Directors may contain up to 27 members representing business, labor, the Federal Government, State and local governments, institutions of higher education, and others from the private and public sectors. The directors determine the Center's role and activities through committees formed to deal with substantive issues defined in an October 1975 policy statement.

The Center is located in Washington, D.C. It seeks to identify the various points of view affecting productivity growth; determine which of these views can be reconciled to further productivity improvement; and encourage within and among various groups cooperative efforts toward productivity growth.

George H. Kuper
Executive Director

"Lifelong learning . . . offers a hope that each one of us can continue to grow -- to achieve his or her full potential -- and to avoid getting stuck in occupational and educational ruts that can lead to alienation and downright boredom."

Walter F. Mondale,
Vice President of the United States

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PREFACE

P.L. 94-136, which established the National Center for Productivity and Quality of Working Life, states:

... there is a national need to increase employment security through such activities as manpower planning, skill-training and retraining of workers, internal work force adjustments to avoid worker displacement, assistance to workers facing or experiencing displacement, and all other public and private programs which seek to minimize the human costs of productivity improvement, thereby diminishing resistance to workplace change and improving productivity growth.

The law requires the Center to "identify, study, and review retraining programs . . . designed to counteract threats to job security which may result from efforts to improve productivity."

This is the third report in a series of studies entitled Productivity and Job Security. The first of the series deals with retraining and the second with the value of an attrition clause.

The first report (Retraining to Adapt to Technological Change) deals with adjustment to specific technological changes. By and large, involved were advance notice of the changes and planning which included the retraining necessary for the adjustment. Unfortunately, technological change is often not accompanied by advance notice and planning; in such instances, "adjustment" does not occur under benign conditions.

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The cases in this study deal with various forms of continuing education and training as preventive measures to promote job security, an issue which was raised in the first report. The studies draw primarily on field visits to IBM sites in Armonk and Poughkeepsie, New York; the Xerox International Center for Training and Management Development in Leesburg, Virginia; and the Municipal Training Division for Pennsylvania in Harrisburg. Helpful written and telephone contacts were also made with the program manager of human resources in the IBM General Products Division, San Jose, California. The Center is grateful to the several corporate and public representatives who were frank in sharing their thinking and experiences on the efficacy of continuing education in providing job security.

This report was prepared by A. Harvey Belitsky, a consultant to the Center. Edgar Weinberg, Assistant Director and head of the Center's human resources program, provided direction in its preparation.

SUMMARY AND IMPLICATIONS

The three case studies which make up this report explore the following question: Whether adjustment to new technologies could not be facilitated if employees underwent continuing training and education related to the jobs they were doing or were likely to do. These studies highlight the fact that most employees are interested in regular training or education if their employment is reasonably steady and the training or education is equated with the opportunity to adapt to new and different job tasks over time. For their part, employers and managers are likely to encourage and provide training only when they believe it will result in higher production or lower unit cost.

The studies focus on continuing education for engineers, technicians, and managers in two large private firms -- IBM and Xerox -- and by an agency of the State of Pennsylvania. They are concerned with adapting to major technological changes, rapid expansion in output, and sizable growth in the work force. They do not represent universal policy implications or applications nor were they expected to do so. Still, the cases are interesting because the experiences they relate do have a relevance not only to comparable entities but also to firms, differing in size and fields of production, which had to adapt to similar economic conditions.

Factors Important to Training

In all three cases, ongoing training and ed- vii

ucation are dependent upon four factors. These are:

- o Employment stability.
- o Management support for training.
- o Adaptation to changing job requirements.
- o Evaluation of training.

The first, employment stability, influences the time horizon of the investment which a firm or public agency makes in employee training. Reasonably stable employment also affects morale and the receptiveness of employees to training.

The second, management support for training, is concerned with the extent to which managers encourage personnel to pursue continuing education and training. It is crucially important to employee interest and participation in ongoing education and training.

Both the third factor -- adaptation to changing job requirements -- and the fourth -- evaluation of training -- relate to job performance as an end product of training. These can involve adaptation to a new and possibly more demanding job and they can be characterized by attempts to evaluate training in terms of the trainee's ultimate job performance, "the most crucial phase of evaluation." 1/

Case I -- IBM

Case I shows that despite the availability of educational opportunities plus strong assurance of enduring employment, many mature engineers did not believe it worthwhile to enroll regularly in job-related educational courses. It was found that mature engineers wanted to feel that they

were optimally productive. They needed to be assigned to the new, challenging tasks which were often reserved for younger engineers with more up-to-date educations. IBM is now engaged in job redesign and other measures to motivate mature engineers to enroll in continuing education and thereby insure their fuller utilization.

Case II -- Xerox

Case II is concerned with the approach to training by Xerox. Xerox considers training to be so important to its corporate interest that it made a huge commitment in a centralized training facility for service technicians, sales, and managerial employees. The facility is on a single site and resembles a college campus.

Xerox has always made opportunities for continuing education available to its employees both inhouse and in educational institutions. Steady employment was all but guaranteed by the rapidly growing firm with the condition that all personnel adapt through training and education to frequent technological changes and changed job requirements.

With the establishment of the expensive new training facility, Xerox has expanded the objective to include productivity advances as a direct result of courses offered. It is also possible that the training facility will allow Xerox to develop internally most or all of its senior managers rather than hire new managers from the outside, as had been necessary during a recent period of exceptionally rapid expansion.

Case III -- Pennsylvania

Case III is concerned with the provision by a Pennsylvania State agency of training to municipi- ix

pal employees. It reveals that when the lack of job security was an overriding concern, the program by itself was not a sufficient stimulus to training.

Training represents a form of investment whose returns are realized over time. Thus it is hardly surprising that in many instances neither local government employees nor the managers see any value in investing in jobs which are no more secure than those of officials who must regularly seek public office.

It can be inferred that in local governments where municipal employees lack the protection of a civil service and merit system and/or managerial support of training, levels of output and productivity are less than the possible maximum.

Some Implications

- o Training provided at no monetary expense may be by itself an insufficient stimulus. IBM learned that training must be connected with career development or at least in response to demands of new assignments. Pennsylvania learned that steady employment is a major element in making training attractive to local government employees.
- o Local government productivity could be improved by an increased commitment to on-going training (given assurance of employment security). Localities might further benefit through improved employee morale and increased productivity if their administrators were exposed by training courses to such important areas as interpersonal relations.
- x o When education is clearly and directly related to job requirements, employees are

more interested in learning and retain more of what they have learned.

- o IBM and Xerox evaluate managers partly in terms of the career progress made by employees who report to them. As a result, managers do not concentrate exclusively on meeting short-term output and profit targets. They also encourage training as well as retraining for new tasks which result in greater diversification of work assignments. This results in better morale and increased productivity.
- o Attempts should be made to evaluate the impact of the different kinds of training and education despite the inherent problems that may be present even when job-related training is involved. Such an effort could lead to a validation system whereby training could be directly related to productivity, which would increase support for training and education. Validation might also result in improved hiring criteria and frameworks for designing certain jobs.
- o Firms which must provide most training internally because they are engaged in developing substantial technological innovations may find that a centralized facility offers operating economies and the nonquantifiable benefits of a collegiate setting.

CASE I. IBM'S EFFORTS TO MAINTAIN FULL UTILIZATION OF MATURE ENGINEERS

IBM considers steady employment to be a positive factor for "morale of the work force," according to the company's chairman. 1/ In support of this belief, IBM has a practice of "full employment" (no layoffs), which brings with it a special inducement to utilize its personnel as fully as possible.

Like other employees of the corporation, IBM engineers have enjoyed stable employment over the years. Major and rapid technological innovation, however, provide the company with a special challenge in maintaining the technical vitality of its engineering population -- a challenge it meets with an extensive educational renewal program, as well as a number of non-educational measures.

Evolving Problem

A number of analysts and educators have identified a problem of "technological obsolescence" among development or design engineers in early or midcareer. As a result of the transistor revolution and other technological changes, a college education in engineering has come to be considered insufficient educational capital to last a work-lifetime. Knowledge of solid state physics, which was not taught when today's mature engineers were in college, has become 1

essential. A former university president has figured that an engineer has a half life of about 7-1/2 years, meaning that the content of 50 percent of engineering courses is different 7-1/2 years after an engineer has received a college degree. 2/

A national slowdown in the growth of research and development expenditures has curtailed the demand for new engineers, leaving many firms with large cadres of mature engineers hired in earlier periods. The great sensitivity in demand for engineers to changing national priorities and economic circumstances produces employment fluctuations that probably exceed those of any other profession. 3/

Changing Emphasis in Education

"Continuing education has been a way of life in IBM from the early days of the company, particularly since the mid-1950s when the corporation entered electronic digital data processing. . . ." 4/ IBM learned that continuing education is most effective when it is related to IBM technologies, products, and systems families. Therefore, it has made a variety of job-related courses widely available. These are usually offered in a classroom setting during the workday; they vary in length from a single day to several weeks. Managers can ask that new courses be developed as needed. An IBM analyst credits these courses with the fact that the "... engineering population has aged about seven years in the last ten [the years 1963 - 73], which means that on-going formal education makes the group technologically younger than its chronological age." 5/

2 The Systems Research Institute in New York City, IBM's "graduate school" in systems edu-

cation, offers a thorough, month-long course providing an in-depth understanding of complex systems. Enrollees have at least 10 years of employment experience. While the course is open to managers, it is primarily for engineers. A less exhaustive systems development course is offered at an educational facility in Poughkeepsie, New York. This one-week, 40-hour course, conducted by design and development specialists, is for engineers with five or more years of experience.

IBM's approach conforms with that enunciated in 1964 by an advisory committee on continuing engineering studies, which was made up of four engineering organizations. The committee called for the "specific enhancement of the competence of the individual as a practicing engineer, rather than the attainment of an additional academic degree." 6/ The report stated: "Unlike traditional education, where each course builds upon its predecessor, independent self-sustaining modules of learning need to be developed." 7/

To help employees attain backgrounds in both engineering and business administration, so as to be effective at managing both material and human resources, IBM devised a full-time, one-week course in project management that is updated every two to three years.

Differences in personnel needs and professional and managerial preferences at the various facilities led IBM to decide that it was worthwhile to encourage the development of various approaches to technical vitality. Committees were established at most locations to consider not only educational approaches ranging from technical communications to sabbaticals but also how work should be structured and whether job rotation should be stepped up. Despite differences in programs from site to site, all found that the long-term benefits of education 3

and training had to be balanced against short-term production requirements. 8/

Not all of the engineers, who were once at the forefront of calculator technology, were able to benefit from efforts at educational renewal. Those who had maintained their academic base or who were young enough to remember basic mathematics, physics, and chemistry were able to be retrained quickly as electronics specialists. However, those with 20 to 30 years of experience who had lost their academic base often needed to shift occupations and go into manufacturing, personnel relations, general management, or sales. These persons received additional training for their new positions.

Reaccreditation and Professional Development

Three innovative educational programs were initiated by IBM within the past 10 years: two are devoted to technically updating engineers, one of which involves reaccreditation; the purpose of the third is to enhance "professional development."

Union College of Schenectady, New York -- Union College conducts a reaccreditation program which updates the undergraduate degrees of a select group of IBM electrical engineers with 10 or so years of experience. Enrollment is voluntary, but managers encourage participation. Tuition and textbook costs are paid by IBM. Courses in prevailing electronic technology are given on a trimester basis. Classes of about 25 are held after working hours and during some release time from work. In the four years that the program has been in existence, nearly 70 engineers have earned certificates of accreditation along with nine credits toward a master's degree.

University of Vermont, Burlington -- The University of Vermont conducts a full-time, 12-month program leading to a master's degree for seasoned electrical engineers. Developed by IBM and the university, the program emphasizes large-scale integration. The program also includes practical experience in designing and manufacturing semi-conductor devices for large-scale integration at IBM's Burlington facility for one summer and during school holidays. Basic or prerequisite courses are offered during the first phase. Families are allowed to accompany students. This educational opportunity is considered to be an honor, and participants are highly motivated to succeed in preparing for changes in their field or broadening their skill base. Both IBM and the university have expressed pleasure with the caliber of the students and graduates.

IBM Poughkeepsie, New York, and San Jose, California -- Both the Poughkeepsie and San Jose IBM facilities offer week-long professional development courses. (Several IBM divisions also provide their own related programs.) Unlike most IBM programs, which are technical or job-centered, these are people-oriented. Heterogeneous groups, composed of professionals from development laboratories, manufacturing, finance, and other units, are encouraged to find a greater awareness of their own long-term desires in their careers.

Usually, enrollees are selected for the program after five to seven years with the corporation, "because for most it is a time of questioning personal objectives, reassessment of the purpose of work and search for the meaning of success in life." 9/

Over 5,000 employees have participated in the program since its inception in 1969. The company feels that participation is "... an im-

portant experience for all successful and growing professionals." 10/

Despite their differences, the programs at both schools share basic similarities: group participation has increased at the expense of lectures; fewer topics are covered but these are gone into more intensively; and more time is devoted to discussing personal and human relations, changing social values, and IBM policies. Most participants are said to "... leave the school encouraged to have a fresh dialog with their managers about personal growth and development, changes in assignment, additional education, and increased responsibility." 11/ Also benefiting from exchanges with engineers and other professionals are top IBM managers who often lecture at the schools.

Ongoing Training and Education

Most IBM engineers work in applied science or development of new processes or products, with relatively few engaged in pure research. Those involved in research are offered a diversity of educational alternatives. A special speaker program ranges from lectures by original thinkers, whose work is not directly related to that of the research division, to seminars on new products conducted usually by IBM development or marketing personnel. Three-month to one-year sabbaticals can be taken within the division, in other IBM divisions, or at academic institutions. A visiting scientist program encourages interaction between outstanding U. S. and foreign scientists and IBM researchers. Continuing educational programs for researchers include courses on current developments and future technologies, various types and levels of study at IBM programming schools, tuition refunds for courses taken after

working hours related to job effectiveness and career development, and participation in professional societies, including publication of papers on nonconfidential aspects of research.

IBM development or design engineers are by contrast usually involved with on-the-job training programs (the firm's largest training effort) and courses given during working hours on current IBM technology. (According to a Labor Department study, these two forms of training are the most highly favored by both research personnel and development or design engineers.) 12/ IBM also refunds tuition for all job-related courses taken at accredited institutions to update knowledge or learn about new applications.

Research professionals nationwide spend 10 hours weekly, either on the job or at home, reading work-related literature and another nine hours reading nonwork-related scientific and technical literature. 13/ Development or design engineers (also nationwide) spend less time on reading. However, a survey of engineers, including development or design engineers who were undergoing continuing education at the University of Wisconsin, concluded that reading professional journals seems to be a convenient (and voluntary) "... basic method necessary for an engineer to maintain his place in the profession." 14/

Training and Education Costs

While a sizable portion of the cost of education is assumed by engineers through the time they devote off the job to reading and attending college courses, the outlays for training and education by IBM and other high-technology firms

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are substantial. (According to a 1967 study, estimated outlays for industrial education to update scientists and engineers, train managers, and introduce new technology exceeded expenditures for all kinds of private and public college education.) 15/

It is difficult to arrive at an exact figure of IBM (as well as other firms') outlays for education and training for two reasons. First, such expenditures are not reckoned with the same financial detail as are production costs. Second, training and education are not considered line items, but overhead costs. 16/ However, since the cost of training and education is part of a facility's overhead, each manager is charged for them and, therefore, has an incentive to send his employees to relevant training and educational programs. In addition, records are maintained for employee enrollment, by course, for each IBM operating unit, and budgeting is done for the various programs conducted at each IBM educational site. Thus an "average" student cost could be calculated.

One published estimate of IBM's expenditures for continuing education was one to two percent of the total development or engineering budget. 17/ A study made several years ago determined that a particular inhouse program cost one-fourth as much as a comparable university course, with the saving attributed to university tuition and transportation costs between laboratory and university. 18/

Evaluating Training and Education

While all training programs are not specifically and quantitatively evaluated, there are several indicators that IBM training and education respond to the corporation's needs. One is

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the high level of technical expertise which enables the company to "apply modern science to the solution of increasingly complex customer problems." Another is that most of the programs have come into being as the result of periodic surveys of the needs of line management, with very few having emanated from IBM training organizations. A third indicator is that of courses offered each trimester, 20 to 30 percent are new. 19/

Evaluation is considered to be more feasible when there are more "mission-oriented" courses and fewer "degree-oriented" programs. 20/ Frequent evaluations of the work performance of engineers are considered to reflect the impact of training. One IBM educator feels that training can be evaluated indirectly, if imprecisely, by comparing the career progression of program participants with nonparticipants.

Subjective appraisals of the professional development program include "positive reactions of management to the participants' enhanced understanding of their roles and relationships to the company," a "continued and sustained demand for enrollment," and highly favorable student ratings. 21/ (The Lawrence Livermore Laboratory, a major institution in the fields of basic nuclear and energy research, evaluates its continuing education on the basis of participants' job performance, but depends "most heavily" on participants' evaluations.) 22/

Job Redesign an Important Factor

Those who work for long periods with technologies which have not radically changed, whose jobs lack variety, or who have not been exposed to new and challenging job assignments are especially vulnerable to loss of technical vitality.

According to the program manager of human resources at IBM's General Products Division, San Jose, California, often training and education must be supplemented by job redesign, job rotation, and transfer. He said:

...in looking at engineering organizations, we noticed that new, challenging problems tend to get assigned to the younger engineers, thus depriving the older engineer of the opportunity to learn and grow. 23/

Job deprivation in older engineers was confirmed by a study of company records for 2,500 design and development engineers and managers in six firms (three aerospace and three in "representative, technology-based commercial industries"): assignments of professionals under age 40 were found to be in the 50th percentile or above in terms of complexity; those over 40 were assigned work "in the bottom half of the complexity scale." 24/ A later analysis of the study found that "differences in performance are greater within age groups than between them. Clearly, it is critical to avoid age-related stereotypes." 25/

Many experts attribute declines in the capacity to acquire new knowledge and proficiencies less to age than to "lack of practice and encouragement." On authority of certain research, "intellectual prowess" bears a resemblance to "physical prowess." Physical jogging is "... only effective if done strenuously and regularly over long periods of time. Mental jogging is no less strict a regimen and offers no easy short cuts." 26/ Such a view has support within IBM. A survey cited by the program manager of human resources at the San Jose facility disclosed that professionals felt that their occupational growth occurred primarily as a result of changes in job or assignment. The IBM booklet, About Your Company, states that enlarging "the capabilities of our people through

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job development" is a "fundamental principle" of the corporation. A professor who has extensively studied "organization and job design" concluded that such measures are the best means to assure the "competence" of a work force. 27/

IBM has tried a variety of job development approaches, often with the many "repetitive and routine" engineering jobs. Using modern technology, the corporation has been able to redesign processes for engineers in computer design who are no longer involved in "hands-on" activity but rather are confined to paper work. This has resulted in bringing "the engineer back into a better balance with the system," by including in the work learning, closure, and feedback. Sometimes job missions have been broadened, by giving engineers greater variety in their work; other times jobs have been narrowed to counter the feeling of being spread too "thin."

Role of Managers Critical

If training and education, actuated by both recurring changes in occupational tasks and redesign of work, are keys to high productivity among engineers, then managers, in current jargon, have a key role in assuring that engineers remain "turned on." IBM's vice president of technical personnel development believes that his firm has a "people-development" orientation and that IBM management does better than that of most other companies. One reason which is cited is that IBM regards highly those managers who are especially good at developing personnel. The importance of this is demonstrated by the one-page "people management" supplement which is part of the appraisal of managers. Usually more than 30 percent of a manager's time is projected to be spent on people management; 28/ and there is periodic eval-

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uation of how long a manager's personnel have been assigned to unchanging jobs.

In general, IBM feels that a broad scope is necessary for stimulating changes in work tasks and in learning as the means for assuring the technical vitality of engineers. 29/

CASE II. XEROX CENTRALIZES TRAINING OF TECHNICAL, SALES, AND MANAGERIAL PERSONNEL

The Xerox International Center for Training and Management Development in Leesburg, Virginia is one of the largest corporate training facilities in existence. Built at a cost of over \$70 million, the facility occupies 40 acres of a 2,300-acre wooded tract. The center can accommodate up to 15,000 trainees a year. Training is offered to technical representatives (who service machines), sales personnel, and managers. The center has a training and support staff of nearly 500.

According to the center's director, Xerox has always considered "people its most important asset." The chairman of Xerox expects training to receive the same attention as activities directly related to production and sales. He has said that while training may be considered a burden, "it's got to become a way of life." 1/ Improved productivity is the desired end result of training.

For years even before the facility was opened in June 1974, Xerox has established a close interrelationship between employment, training and education, and technological change.

With a number of xerographic patents now in the public domain, the company has found that competition has increased. Furthermore, future developments of already complex products are bound to be even more sophisticated. Xerox determined that its success in the marketplace

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depends on providing intricate products of high quality for the information needs of business and government, and the only way of doing this is by providing superior training to its employees. (The goals of Xerox appear to be consistent with those expressed for the Western Electric Corporation Education Center, which sees itself "... not only in the role of teachers, but also as catalysts in speeding up the introduction of new technological ideas into Company operations.") 2/

Desirability of a Single Training Center

Although some firms have centralized training facilities, it is more usual for companies to have several training locations. A Xerox study in the late 1960s showed that it was desirable to consolidate training of technical, sales, and managerial personnel into a single facility. Training was being conducted in the corporation's branches and its six regional training centers. It was determined that consolidation would eliminate duplication in instructors, instruction space, and hotel space for housing trainees. Variations in approach and quality of training could be removed. And an academic setting entailing "integrated living learning areas" would encourage a sense of community and interchange among trainees from different occupations and geographical areas. 3/

However, Xerox continues to train many of its manufacturing, information service, and engineering personnel in Rochester, New York, where products are designed and manufactured, and "where the machines are." Also available there are the educational facilities of the University of Rochester and the Rochester Institute of Technology, both of which receive gifts from

Branches and the Training Center

Xerox branches throughout the country determine who undergoes training on the basis of needs created by technological change and attrition in the work force. Full-time branch training managers for sales personnel and for technical representatives prepare trainees and then continue to work with them when they return to the field. The managers are guided by performance profiles of strengths and weakness which the center prepares for each trainee. Because some center courses are recommended for college credit through the American Council of Education's Project on Noncollegiate Sponsored Instruction, some employees have been encouraged to continue their college education on their return to the branches. Xerox pays part of the tuition upon successful completion.

Preparation of Courses

According to the center's manager of education services, training courses are prepared in response to the "needs of the field" -- the result of new technology, new products, altered marketing plans, establishment of new jobs, or evaluation which shows that current training is inadequate. The center offers over 60 courses.

Development of a course begins when a product is on the drawing board. In the case of the 9200 duplicating system, the course preparation began three years before introduction because the machine is so intricate.

In preparing a course, a task analysis is made of the affected occupation and a performance model is derived which pinpoints tasks for which training is necessary. A learning

model is then prepared consisting of the sequence of teaching tasks and how they fit the objectives of the course. Finally, lesson plans are written and presentation media are chosen. The center sometimes uses the programmed learning products developed by Xerox Learning Systems.

Classrooms

The center's 113 classrooms have the most advanced audio-visual facilities. The classrooms are octagonal, so that the instructor is not viewed as reigning at the head of the class. Classes in the sales field consist usually of 10 trainees, a number particularly adapted to "learning in the round." This stimulates student-instructor participation and aids students to learn from each other as well as from the instructor. 4/

Sales instruction classrooms are close to role-playing rooms. In addition to a considerable investment in Xerox copying equipment, the center has other elaborate instruction equipment, including graphic arts apparatus for four artists, two audio studios, and a T. V. production studio with control and master control rooms.

Instructors

Instructors are drawn from among the top performers in their areas of expertise and usually stay at the center for two or three years. They are of such a high caliber that most are promoted to managerial positions in their branches when their teaching stint is over. Some of

those who wish to stay and make a career of teaching are given an opportunity to become senior technical instructors.

Instructors draw upon their actual experiences. They also receive special training in lesson planning, classroom management, and counseling.

Trainees

The Leesburg center can accommodate up to 1,000 trainees at a time. Trainees are drawn mainly from the two groups of employees who are in direct contact with the firm's customers: sales representatives and technical representatives. The center also trains managers at all levels; those who have attended the courses are expected ultimately to number in the thousands.

Training is strenuous and is scheduled from 8 to 5 daily. However, no problems have been encountered in training even those workers who are somewhat older but are also expected to keep abreast of technological changes. Trainees are encouraged to use the varied recreational and physical education facilities to learn how industrial stress can be reduced.

Sales, technical, and managerial personnel are not segregated, but rather housed together in comfortable but not plush individual rooms. Some courses are "cross-taught," with, for instance, a sales instructor lecturing technical representatives.

Trainees are predominantly from Xerox branches in the United States. However, a majority of Canadians enroll, and a small number of English-speaking Latin American employees receive product training.

Technical Representatives

Technical representatives are taught highly specific, task-related skills needed to repair and maintain equipment. Knowledge in the "nice to know" category is not conveyed because, as the manager of education services explained, it would not be cost-effective. Most trainees have a technical school background or mechanical or electrical experience with another firm. Those who received technical training while in military service are often competent new hires, but that source is drying up. According to a senior instructor, individuals who grew up on a farm or worked on automobiles often become capable technicians. The basic requirement for trainees, however, is a good, logical mind.

Technicians may begin training with a two-week course that consists largely of practical laboratory work on the 660 copier. They then work on the job for several months and, if this experience is favorable, may return to the center for training on more sophisticated equipment.

Some of the technicians now begin their training on the 9200 duplicating system, Xerox's most complex product. The 9200, which does not require a skilled operator, contains a miniature computer; it is the most expensive office system, producing 7,200 copies per hour and can automatically receive, duplicate, and collate up to 50 different documents.

Each training laboratory is equipped with 10 of the 9200 duplicating systems. Each lab can accommodate 18 students; the student-instructor ratio there is six to one. Most of the trainee's time is spent in self-paced instruction in a laboratory.

18 The course normally runs six weeks, but

this is flexible -- some may finish in four and one-half weeks; others may take seven weeks. A minor proportion of the newly-hired technicians do not complete the 9200 course. These people return to their branches, and after more skills training, return to the center to learn how to service less complex equipment. They may return to the the center a year or two later for another try on the 9200.

Student self-paced or criterion-referenced instruction (tests for which criteria are set) has been developed for various modules of the 9200 course. Practice troubleshooting is done before tests are taken, with an instructor signing off on each course module so that the trainee can move on to another. Criterion tests are given individually; however, at an early stage, pairing occurs and a slow learner may sometimes benefit from being paired with a fast learner.

Those who complete the training are issued microfiche maintenance and parts manuals and hand viewers; each microfiche contains the equivalent of nearly 100 pages of text. Continuing education in the form of home study courses is also available.

Training is highly job-oriented, and those who do well are able to advance on a determined career ladder consisting of the following:

- o Associate Technical Representative (on-the-job training for first six months of employment).
- o Technical Representative (responsibility for machines in an assigned territory).
- o Senior Technical Representative (responsibility for more complex technical problems -- troubleshooting).
- o Technical Specialist (responsibility centers 19

on training in the branch, including diagnostic training and human relations training for contacts with customers).

- o Technical Instructor at the Leesburg center (promotion from either the technical representative or technical specialist positions and the possibility of progressing to senior trainer or training manager positions at the center).
- o Field Service Manager.
- o Branch Service Manager.

Sales Personnel

Various levels of training are offered to sales personnel. Newly hired sales personnel take a three-week basic course, spend about six months in the field, and then return for advanced training. In the advanced sales course, trainees learn about numerous capabilities and applications of sophisticated equipment. Also offered is specialized training in 14 vertical markets, including manufacturing, aerospace, banking, insurance, and law, which have their own paper flow and special problems. Managerial training for sales personnel is also available.

Sales training consists predominantly of a one-to-one role-playing relationship. The instructor usually plays a reluctant customer and the exchange is videotaped and played to the entire class for criticism and comments. Training also includes watching other videotaped recordings and instructional exposition. Sales personnel sometimes return a half dozen or so times to the center for training on specialized products.

Managers

According to the chairman of Xerox, it is necessary to improve management development so that more top positions can be filled from within. (Many managers were recruited from outside during the company's exceptionally rapid growth period.) The chairman told his top managers, "From now on you'd better start growing your own [managers] or you're not going to have [them]." He also made it clear that the ability of managers to secure training for their personnel must be considered as important as "any other part" of a manager's job. 5/

Management training, the type of training most recently introduced at the center, is also designed to avoid "managerial obsolescence", which, as reported by one survey, three-fourths of 60 firms questioned considered an existing or possible problem. Another study traced over 40 percent of managerial layoffs to technological change and obsolescence. 6/

Courses are provided for first-line sales and service managers, executive (upper) managers, and middle managers in sales, service, and support functions. Emphasis is on courses for middle managers to compensate for their relative lack of training. One program for middle managers is titled "Managing Tasks Through People." Classes consist of about 20 managers from the United States and Canada.

As in all managerial instruction, learning is by a "participative and experiential approach", with no self-pacing. Courses are designed to "assure job relevance" by dealing with needs revealed in company surveys. Actual "Xerox situations" are used to provide "an opportunity to plan the application of course learnings back on the job." Electives are available to meet specific needs. 7/

Evaluating Training

The substantial investment in and commitment to training makes it important to learn whether the outlay provides an acceptable return on investment. Xerox employs 13 of its own people full-time and 22 consultants to prepare and evaluate courses given at the Leesburg center.

The same quality control process that applies to evaluating marketed products is used before courses are adopted so that refinements and revisions can be made. A series of tests are employed: an editorial test, made by someone who has not been involved in the preparation of the course; a development test, consisting of the teaching of the course by its developers; and a pilot test, in which regular instructors are trained and then teach a few test classes. Established courses and trainees are evaluated continuously. The entrance test which all trainees take on arrival at the center becomes a base of comparison for later evaluations.

Evaluation takes three major forms. The first involves verification of teaching methods, and asks, do students learn what they are taught? For example, 80 percent of a sample of students in a technical representative course must pass the performance test at the end of the course. The second is concerned with the general instructional system, and asks, can a course be taught better or at lower cost? Trainees are surveyed every three months on their impressions of the center, ranging from instructor performance to quality of food. As a general finding, instructors in self-paced courses who spent over half of their time in direct contact with students and provided them with considerable "feedback" were most likely to have students who performed well on the performance test at the end of the course. The

third is concerned with validation of design, and asks, have trainees been taught the right things? or, "Does performance on the end-of-course objectives relate to the ultimate productivity and field performance of the students?" 8/ This evaluation is accomplished by followup of trainees in their branches; it is known as "field tracking" or "field relevancy study."

In order to tie validation to productivity, two types of factors must be identified. First are job performance indexes by which productivity can be measured. These involve performance of large and independent tasks -- for example, preparing a customer survey and time required to pinpoint and repair a typical machine failure. The second are environmental factors which are outside the influence of training and personal differences and have an impact on productivity.

It is possible to derive measures of job productivity in divisions of Xerox branches involved with personnel appraisal, compensation, and career development. Sales personnel have always been paid on the basis of new machines sold or leased and customer retention of leased machines. 9/ The training of technical representatives will be able to be validated when their compensation is tied more firmly to their productivity. However, before this can be done, some problems must be dealt with -- for example, the mix of equipment handled by a technician and the distance traveled to service machines.

A connection can also be shown between training and job performance in quantitative areas of management -- budget, finance, and career progression in a manager's staff. It is more difficult to evaluate the role of transactional analysis in improving personnel management.

Xerox's evaluators are also attempting to 23

determine the costs, as well as the benefits, of training. Reasonably good cost estimates are thought to be available. While opportunity costs -- the loss of field production while an employee is in training -- are not computed, each branch is charged the salary of any of its enrolled employees. The center defrays all other expenses.

The promise of successful validation extends beyond "validating training objectives." It "...also suggests means for improving productivity by addressing environmental influences and personnel selection criteria." Research by Xerox evaluators has shown that achievement after training seems to be related to the extent and type of job experience, but not to the level of education. Thus, it is possible, "by identifying factors that account for difference in criterion performance among students... to construct guidelines for student selection, [course] material modifications, course administration, instructor training, or the nature of the job itself; the investment in diagnostic evaluation may well pay large dividends in training cost-effectiveness." 10/

CASE III. STATE AGENCY TRAINS AMIDST JOB INSECURITY IN PENNSYLVANIA MUNICIPALITIES

Regular training is as important for developing human resources and raising productivity in the public sector as it is in the private sector. Nonetheless, the commitment to training on the part of local governments is far from ideal. According to a recent survey by the International City Management Association, "... municipal in-service training is generally still undertaken as an appendage to ongoing activities."

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To provide training for local government employees, the State of Pennsylvania set up a Municipal Training Division in 1968 for "under-trained administrators and employees." 2/ Other States have established similar institutions. However, Pennsylvania's program was selected for study here because, according to public administrators outside the State, a fine systematic program has evolved.

The program is also noteworthy because of the factors which have severely limited its effectiveness (and which others, warned, might be able to avoid). A major disadvantage has been fluctuating employment at the local government level. Others include lack of management interest in employee training, inadequate operating funds at both the State and local level, and inadequate time for training elected officials.

Local Government Training Gains in Importance

The importance of adequately trained local 25

government personnel has been increasing in recent years. Citizens are demanding more and better services at the same time that they are revolting against increases in taxes. Costs continue to skyrocket. New Federal revenue-sharing programs have increased the burden of responsibility shouldered by local governments. And new Federal and State laws regarding community development and environmental protection have placed further demands on local employees. 3/ Clearly, the better use of personnel through training to increase productivity is an answer for these embattled municipalities.

The State's Role in Training

Pennsylvania, the third most populous State in the Union, is composed of over 2,600 incorporated municipalities. These are chartered by the State of Pennsylvania and are therefore creatures of the State. Because home rule is somewhat limited, the partnership between the State and its municipalities is unique.

There are several reasons why training of local employees should be provided by an "outside source" 4/ (that is, an agency of the State). Many of the municipalities are very small and are unable or unwilling to pay for training. They lack the expertise to provide adequate training. Uniform instruction among municipalities is desirable in several areas -- for example, water management and sewage treatment, which are administered by municipalities but governed by State regulations. A State training program can provide the entire State with a trained cadre of operators. 5/ It also increases the likelihood that personnel will keep abreast of technological change. And with the growth of urban and suburban sprawl, boundaries are tending more and more to blur; counties, boroughs, cities, and

townships are beginning to share more of their problems -- and their personnel.

Employment Insecurity

For many Pennsylvania local government employees, employment is of a temporary nature. In part, this is because there is no merit system or civil service protection. Most local government jobs are appointive; when new officials are elected (for terms ranging from two to six years), appointees of the previous administration may be replaced by those of the victors. Turnover is very often swift and employment security is often nil. Even in those instances where officials are re-elected to office time and again, large numbers of local government employees are affected with uncertainty over their jobs. As a result, the incentive for training is not significant for both employees and local government management.

State Agency Centralizes Training

The State agency responsible for training is the Municipal Training Division (MTD) within the Department of Community Affairs. The MTD evolved from the Public Service Institute which had come into existence in 1936 when Congress passed the George-Deen Act. The Act, whose emphasis was primarily on vocational education, also provided States with Federal funds to set up inservice training in numerous occupations. Elected officials were included in the 1950s. During the late 1960s and early 1970s, the training of school business officials and other employees in the schools was emphasized.

State funding of the MTD has provided greater flexibility than was the case when training was dependent on vocational education monies. The MTD provides training for the State's over 14,000 elected local officials. In addition, it provides training for, among others, local administrators, managers, planners, water and sewer treatment operators, assessors, and code enforcers. Most managerial training is defrayed by funds received under the Federal Intergovernmental Personnel Act. Water and sewer treatment training is funded by the Federal Environmental Protection Agency along with the State.

The MTD no longer has anything to do with schools, nor does it train State employees. While it offers management training for police, law enforcement training is handled elsewhere. The same is true for fire control.

Determining Training Needs

Training is initiated via a variety of means. MTD conducts frequent "needs surveys" by mail, phone, or simply questioning a group. Local officials can request training. And training efforts can result from legislation; for example, the 1968 State law requires certification of water and wastewater operators.

The MTD also recognizes that those whose employment is stable need continuing education and training and those whose jobs depend upon electoral vagaries need entry-level training. According to MTD estimates, about two-thirds of those in training are learning a job skill, while the remainder are being taught the legal responsibilities of their jobs.

28 The table shows the number of trainees en-

Trainees by Functional Area -- MTD,
Harrisburg, Pennsylvania, 1973-76.

<u>Enrollees by</u> <u>Program Area</u>	<u>Fiscal</u> <u>1973-74</u>	<u>Fiscal</u> <u>1974-75</u>	<u>Fiscal</u> <u>1975-76</u>
Local Gov- ernment	1,677	928	3,016
Community Development	2,939	3,875	4,876
Management	3,309	4,113	3,395
Environmental Protection	1,307	2,741	2,372
Other	<u>4,758</u>	<u>2,909</u>	<u>1,447</u>
Total	13,990	14,566	15,106

rolled by MTD by functional area between 1973 and 1976. The total increased by 1,100 between the first and last fiscal year periods recorded. However, more substantial variations occurred within broad program areas. The reduction in the Other category (1975-76) reflects the MTD's relinquishment of training for educational and law enforcement officials. Local Government also shows wide fluctuations, the result of changes among officeholders affected by elections. The increase under Community Development reflects the growing importance of code enforcement, which falls within that category. (Pennsylvania leads all other States in code enforcement training; it is probably also the leader in training in water and sewage treatment.) Within Management, the financial management course enrollment declined steadily over the three fiscal years. This may reflect an initial surge to improve capabilities and possibly learn

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how to deal with new Federal requirements on the part of several hundred employees whose employment stability is somewhat greater than that of most other local government workers.

Flexibility in Training

The MTD accommodates course offerings to the working schedules of the trainees. Water and sewage treatment workers tend to work in small plants and cannot be released to attend daytime classes, so their program is usually conducted at night. Evening classes are also held for elected officials. Appointed officials tend to prefer daytime classes. Code enforcement courses have been successful when conducted during the day but not at night.

Courses are held at a variety of sites: at a central location within the State, at one or more regional sites, by correspondence for those in out-of-the-way locations, and sometimes at the worksite itself. The last has the advantage of allowing all employees to undergo training, thereby avoiding resistance on the part of the untrained to new ideas which might be introduced by the trained.

The length of the courses varies from 3 to 60 hours but averages 15 hours. Courses are held from one afternoon a week to four successive days for intensive training. For water and wastewater treatment, the course runs for three hours one night a week, over 10 to 12 weeks. Minimum enrollment per course is 15 people.

Tuition Fees

Whereas most courses have been provided
30 free to the employees, including managers and

administrators and the municipality, modest tuition fees of \$10 to \$25 are now being assessed. A registration fee of about \$25 is charged for the water and sewage programs. A fee is also charged for the code enforcement course. These are paid by the municipality or the individual. Some of the impetus for charging for all courses is the result of a view that "free training is worth what you pay for it." The folly of assessing fees for training on the basis of this view can be settled by pointing out that workers make a sufficient commitment to and investment in training simply by enrolling in and taking a course, especially if this occurs after normal working hours.

Preparation and Delivery of Courses

According to the head of the MTD, several different agencies administered training programs for local government personnel as late as 1971. Many of these programs were provided by State colleges and universities, a practice which the MTD followed when it first came into existence and its staff was very small. However, these academically-originated services were judged to be "... too sophisticated and esoteric for the local officials involved [and] also proved to be of little utility...." Next, the MTD utilized outside consultants and trainers. While the courses were good in quality, they were high in cost; moreover, because the consultants often had little previous involvement with local government, they sometimes failed to capture the interest of the officials who took their courses. 6/ As a result of the impact of these experiences, the MTD has spent several years generating confidence in its training.

MTD now selects part-time instructors from 31

its own staff, local officials and managers, engineers, professionals, consultants with municipal experience and faculty members of colleges and universities (the last make up about 5 percent of the total). In preparing a course, for example, in skills training for road and street maintenance, the MTD staff meets with road builders or the association which represents them as well as the State Department of Transportation. They then make a problem assessment, which for certain managerial courses is rather sophisticated.

The MTD uses an advisory committee system in several training areas, chiefly in management. There are committees for geographic areas representing about 75 percent of the State's population. They are made up largely of local officials who formulate the number and types of training programs which are to be offered in their region.

The MTD has generated textbooks and manuals which emphasize general skills development and problem-solving. Some materials are purchased from universities. Written materials are supplemented by demonstrations, films, and field trips.

Prospective trainees are informed of the availability of courses through a variety of sources, important among which are agents of the Pennsylvania State University cooperative extension service who are positioned throughout the State.

Fostering Training

32 Training in a few fields -- water and sewage treatment, for example -- is mandated. However, most is voluntary and employee participa-

tion seems to depend upon the support and enthusiasm for training on the part of management -- the administrators and elected officials in the localities. The MTD has found that city and town managers tend to support training as do municipal clerks. However, elected officials, who normally control local governments, are far less likely to promote training because they fail to see any direct benefits from it for themselves. For their part, many appointed officials often do not devote full time to their municipal responsibilities; thus, people who serve by appointment on a local sewage authority are likely to work full time at other totally unrelated jobs and therefore have little time or inclination to become educated about the requirements of their civic jobs.

Inadequate revenue bases also mitigate against training, as does the "undermanaged or nonexistent staff of administrators" ^{7/} who shy away from training for their employees because they are neither knowledgeable nor convinced of the need for it. Thus there are instances where employees initiate steps for training and are then frustrated by their superiors. Junior supervisors and other employees have often been heard to make such remarks as "It's too bad my supervisor didn't go for training."

The MTD is in the process of preparing a manual on a variety of environmental problems, including water and sewage treatment, for the purpose of educating elected and appointed officials in the complexities of environmental control and the need for more trained personnel.

Training can be fostered by stabilized employment, and this is most likely to come about from a more widely used merit system. Unionization of public employees has grown, and unions of course are concerned with all forms of job security. Most of the State's counties are expected to have some unionized employees in a

few years, although this cannot be said for the smaller communities.

Training Needed for Managers

Few Pennsylvania localities have personnel systems of any sophistication, and most have no staff for training. As a result, some local managers and administrators have little appreciation for the value of training. In contrast with Federal managers, most of whom have had some training in managerial science, operations methods, agency goals, and interpersonal relations, 8/ they often ignore or do not know how to cope with complex problems.

The MTD is trying to rectify this situation by placing special emphasis on management training. Most MTD funds are spent for management training, and of those who enrolled for training during 1975-76, more than one-fifth are in management. The problem is that the majority of managers must take orientation courses as the result of job insecurity. Moreover, many "repeaters" show up when revised or advanced courses are offered.

The City of Philadelphia is notable in that it has a sophisticated civil service for managers along with a job classification plan which provides opportunities for career progression. Advanced management courses are offered by Philadelphia's training department, which has received much assistance from the MTD. The MTD also combined recently with the Pennsylvania Municipal Manager's Association to form the Pennsylvania Municipal Management Institute to provide certification for those completing advanced management training.

Evaluating Training

34 Although the high rate of job turnover makes it difficult to evaluate training, nevertheless the

MTD is attempting to make such an assessment of its entire training program in terms of who is being trained and who is being ignored, methods of administering training, and the cost and contributions of specific programs. All trainees who complete a course are asked to comment frankly on program content, instructor performance, and changes they suggest. A more sophisticated followup of trainees on the job is anticipated after trainee records are further systematized.

However, the MTD has yet to determine how employees can be tested at the start of a course, upon its completion, and later on the job. According to an MTD researcher, ideally objectives would be set for each course, with evaluation criteria based on trainee tests, appraisal of their performance by supervisors, and possibly "observations" by their peers.

ICMA Survey

Of nonuniformed local government employees in the 500 largest jurisdictions nationally which account for 80 percent of State and local government employees, a great majority are protected by some sort of merit system and therefore enjoy reasonable job security. Even so, it is considered uncommon for local governments to provide "top quality service economically." The reason, according to one professor at a university institute of government service, is that effective local government "... requires recruitment, selection, appointment, and promotion on merit bases. It calls for adequate compensation, employee training, performance standards and evaluations, and rewards for creative suggestions and outstanding performance."

9/

To upgrade local government services 35

through training employees, nearly two-fifths of all States have State agencies similar to the MTD in Pennsylvania. 10/ Despite the presence of such training facilities along with a merit system, municipal inservice training was generally still found to be inadequate, according to an International City Management Association (ICMA) survey of all cities with a population of 10,000 and over (59 percent responding).

The survey also revealed that no training was provided by more than 35 percent of the cities (typically with populations under 25,000). "Although many excellent courses, seminars, conferences, and other programs are being used, there is little evidence that they are part of a comprehensive, ongoing strategy for increasing individual and organizational effectiveness." 11/

Major reasons given for this follow: 12/

1. In the absence of a single person or department responsible for training, the approach to training is uncoordinated.
2. Training is not so much aimed at managers or chief administrative officers or their assistants, but at skill development. This results in there being no support for training from the top.
3. Training budgets are typically small, with the great majority of cities allocating less than 0.5 percent of the total municipal budget.
4. Municipalities do not try to evaluate their training programs. Most evaluations are irregular and moreover consist of "... informal feedback from trainees, a system that may help promote an uncertain attitude about the value of training." Such quantitative factors as reduced grievances and dis-

ciplinary problems, job turnover, and absenteeism are least used, possibly because training for department heads/middle management is in such hard-to-quantify areas as management principles, decision making, and problem solving. (However, it is possible to evaluate training even in the less quantitative areas if, as realized by the Pennsylvania MTD, "goals or change analyses" are set.)

ICMA's definition of training as "an investment in the human resources of an organization" suggests the possibility of a long-term nature in the payoff of training. 13/ It follows that reasonably stable employment is a prerequisite for making such an investment.

FOOTNOTES

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